CHAPTER I
INTRODUCTION

A. Background

Soil conditions in the Pencil Village of Jatikuwung in the subdistrict of Karanganyar district of Jatipuro consist of clay. Soil layer in pencil village is the soil base of alternative roads that connect the Jumapolo sub-district and Jatiyoso sub-district. Clay has high plastic properties, swelling and shrinking. The characteristics of soil make the volume and strength of the soil change especially during the rainy season due to increasing water content. The condition of expanding soil volume causes cracks, bumps, and even landslides to occur. This caused disruption of the activities of residents who used roads that connected the Jumapolo sub-district and Jatiyoso sub-district.

Based on this, reinforcement on roads is needed to reduce and prevent potential landslides. Landslides are the displacement of slope-forming materials such as rocks, soil or a mixture of both by moving down or out of the slope. There have been many methods of soil reinforcement to prevent landslides of one of it is soil nailing. Soil nails are reinforcing, passive elements that are drilled and grouted sub-horizontally in the ground to support excavations in soil, or in soft and weathered rock (NHI, 2003). The reinforcement material can be bamboo, iron, and minipile. To avoid the failure of soil nail, safety factors must be analyzed for internal stability and external stability.

Based on the explanation above, this study aims to prevent and reduce the potential for landslides. The method used is soil nails which are analyzed with the geostudio slope / w computer program and manual calculations. An analysis will be carried out with models before and after the installation of soil nails. This study entitled soil nails analysis using geotudio slope / w.

B. Statement Of The Research

Based on descriptive above, the statement of research can be seen below :

1. Need to conduct research on internal stability dan external stability for soil nailing.
2. Finding the value of safety for soil nails with computer program geostudio slope/w and manual calculation.

C. Research Objectives

The main objectives of this study are:

1. Designing dan calculating soil nails dimension.
2. Finding the safety factor of soil nails using geoslope/w and manual calculation.
3. Comparing the safety factor of manual calculation with the result of the geoslope/w calculation.

D. Research Benefits

The result of this research is expected to :

1. Increasing knowledge about strengthening slope using soil nails.
2. Understanding and be able to operate geoslope/w.
3. Save time in solving the geotechnical problem with a computer program.
4. Helping to solve the landslide problem in Indonesia.

E. Problem Limitation

1. This research was carried out on the Pencil Jatikuwung Village road, Jatipuro District, Karanganyar Regency with a disturbed sample.
2. Slope stability analysis using ordinary method of slices (fellenius method).
3. The model in the form of slope reinforcement uses soil nail with the dimensions needed in the field.
4. In the manual calculation of the calculation of concrete cover and grout, it is not calculated.
5. Groundwater level and seismic analysis are declined.
6. The soil nail analysis is done on external and internal stability.
7. Calculations are only limited to soil nails, not including the construction method of soil nails.
8. The secondary data of soil taken by the latest study by Lestari kurniasih (2017). The data are shown below:

Table I.1 specific gravity, water content, and soil weight.

Depth (m)	*Specific gravity (Gs)*	Water content (%)	Unit weight (saturated) (gr/cm^3)
-3.00	2.77	13.164	1.91
-6.00	2.64	16.841	1.86
-9.00	2.41	20.833	1.81
-12.00	2.7	23.5	1.85
-16.60	2.65	24.2	1.82

(source: research from lestari kurniasih, 2017)

Table I.2 cohesion and friction angle of soil.

Depth (m)	Cohession (c) (Kg/cm^2)	Friction angle (ø) (°)
-3.00	0.087	31.71
-6.00	0.113	28.71
-9.00	0.108	28.71
-12.00	0.150	27.50
-16.60	0.140	28.30

(Source: research from lestari kurniasih, 2017)

Figure I.1 cross section of slope that will be analyzed (in meter).

F. Authenticity of Research

There are several studies that are similar to this study with different cases and locations. Following are the similarities and differences from some similar studies:

Table I.3. the similarities and differences from some similar studies.

No	Title	Author	Aims	Location
1	Soil nailing design by using Geo5 program	Sri Ardiyati Kusuma Wardani	1. Designing and calculating the dimensional of the soil nail wall. 2. Finding the value of the safety factor of soil nail wall using Geo5 program.	Research placed on Piyungan, Gunung Kidul.
2	Analisis stabilitas lereng dengan perkuatan soil nailing menggunakan perhitungan fellenius dan taylor serta program geoslope	Loga Mauludvi Rahmanta, Hanindya Kusuma Artati	1. Providing alternative for slope stability on desa srimartani, kab bantul. 2. Knowing the factor of safety before and after installing soil nails. 3. Designing soil reinforcement based on stability and safety factor analysis. 4. Designing soil nails dimention	1. research placed on Desa Srimartani, Kab Bantul.

This study focuses on designing soil nailing for slope areas, using the geoslope program and re-analyzing it using manual calculations to determine the safe numbers of soil nail reinforcement. This study uses soil data from a previous study entitled "Landslide Mitigation on Pencil Jatikuwung Village Road Section in Jatipuro District, Karanganyar Regency by Using Geotextiles" by lestari kurniasih (2017). This research has also been conducted in the civil engineering department, engineering faculty, Universitas Muhammadiyah Surakarta.